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Abstract

URANIUM RESOURCES AND RECOVERY PROCESS IN JAPAN

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The result of the systematic prospecting by the Geological Survey of Japan and Atomic Fuel Corporation has shown that the national uranium ore reserve containing more than 0.01 % U_3O_8 is 3,000,000t (their average grade : 0.06 - 0.07 % ; total recoverable uranium content : about 2,000t).

At present, the ore reserve is concentrated at the Ningyo-toge district in the so-called Chugoku Massif region, South-West Japan. The uranium ore deposits occur horizontally in the basal parts of the Neogene Tertiary sedimentary rocks overlying granites.

In Japan, there are many areas with the similar geologic conditions to Ningyo-toge and in these areas, the energetic researches and prospecting are now under way, so that the sharp increase in the ore reserve can be expected in the future.

Juding only from their grade, it is impossible for Japan to compete successfully in the cost with accepted world price by the conventional production methods. In spite of their being low grade, the uranium ores in Japan have a lot of favourable properties, that is, they consist of very loosely cemented conglomerates and arkose, the uranium minerals occurring as fine grained crystalls in the soft and porous parts are easily soluble in acid, and there are almost no minerals interfering with processing or containing elements with high cross section for neutron absorption.

These characteristics enable us not only to expect the lowering of mining cost by hydraulic method, but also to develop the economical processing technology of domestic low grade ore.

The uranium recovery process developed by us is outlined below. The ore is crushed, washed and classified to ore concentrate of particles finer than 100 mesh. The grade of concentrate is of ca. 0.3 % U_3O_8 and the recovery amounts to 70 %.

Fine particles of ore are conditioned to about 20 % moisture, pugged uniformly with a small amount of conc. H_2SO_4, heated to 120°C for few minutes and then treated with hot water to leach uranium.

Thus we could improve the filterability very much because soluble colloidal silica is changed to insoluble form, and obtain a pregnant solution of higher uranium concentration than by conventional acid leaching.

The pregnant solution is treated by amine extraction process, and then uranyl sulfate complex is converted into chloro complex by scrubbing with conc. HCl, while being retained in the organic phase. The refined UO_2Cl_2 solution is obtained by stripping the solvent with very dilute HCl.

Finally anhydrous UF_4 is prepared through steps of electrolytical reduction, hydrofluorination and dehydration.